NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
MTH 288 – DISCRETE MATHEMATICS (3 CR.)

Course Description

Presents topics in sets, counting, graphs, logic, proofs, functions, relations, mathematical induction, Boolean Algebra, and recurrence relations. Lecture 3 credits. Total 3 credits per week.

General Course Purpose

The goal is to give the student a solid grasp of the methods and applications of discrete mathematics to prepare the student for higher level study in mathematics, engineering, computer science, and the sciences.

Course Prerequisites/Corequisites

Prerequisite: MTH 263 with a grade of C or better or equivalent.

Course Objectives

- Note: Methods of proofs and applications of proofs are emphasized throughout the course.
- Logic - Propositional Calculus
  - Use statements, variables, and logical connectives to translate between English and formal logic.
  - Use a truth table to prove the logical equivalence of statements.
  - Identify conditional statements and their variations.
  - Identify common argument forms.
  - Use truth tables to prove the validity of arguments.
- Logic - Predicate Calculus
  - Use predicates and quantifiers to translate between English and formal logic.
  - Use Euler diagrams to prove the validity of arguments with quantifiers.
- Logic - Proofs
  - Construct proofs of mathematical statements - including number theoretic statements - using counter-examples, direct arguments, division into cases, and indirect arguments.
  - Use mathematical induction to prove propositions over the positive integers.
- Set Theory
  - Exhibit proper use of set notation, abbreviations for common sets, Cartesian products, and ordered n-tuples.
  - Combine sets using set operations.
  - List the elements of a power set.
  - Lists the elements of a cross product.
  - Draw Venn diagrams that represent set operations and set relations.
  - Apply concepts of sets or Venn Diagrams to prove the equality or inequality of infinite or finite sets.
  - Create bijective mappings to prove that two sets do or do not have the same cardinality.
- Functions and Relations
  - Identify a function's rule, domain, codomain, and range.
  - Draw and interpret arrow diagrams.
  - Prove that a function is well-defined, one-to-one, or onto.
  - Given a binary relation on a set, determine if two elements of the set are related.
  - Prove that a relation is an equivalence relation and determine its equivalence classes.
  - Determine if a relation is a partial ordering.
- Counting Theory

◦ Use the multiplication rule, permutations, combinations, and the pigeonhole principle to count the number of elements in a set.
◦ Apply the Binomial Theorem to counting problems.
• Graph Theory
◦ Identify the features of a graph using definitions and proper graph terminology.
◦ Prove statements using the Handshake Theorem.
◦ Prove that a graph has an Euler circuit.
◦ Identify a minimum spanning tree.
• Boolean Algebra
◦ Define Boolean Algebra.
◦ Apply its concepts to other areas of discrete math.
◦ Apply partial orderings to Boolean algebra.
• Recurrence Relations
◦ Give explicit and recursive descriptions of sequences.
◦ Solve recurrence relations.

Major Topics to be Included

- Logic - Propositional Calculus
- Logic - Predicate Calculus
- Logic - Proofs
- Set Theory
- Functions and Relations
- Counting Theory
- Graph Theory
- Boolean Algebra
- Recurrence Relations